

Powerpoint Presentation:

ECOLOGICAL COMMUNITIES OF THE NORTHERN VIRGINIA BLUE RIDGE

Design, photographs (unless otherwise indicated), and text by:

Gary P. Fleming

Vegetation Ecologist

Virginia Dept. of Conservation and Recreation, Division of Natural Heritage

217 Governor St., 3rd Floor

Richmond, VA 23219

(804) 786-9122

gffleming@dcr.state.va.us

Originally presented:

October 4, 2003

at a multi-state Native Plant Society Conference entitled “The Blue Ridge Mountains and Potomac Valley in Maryland, Virginia, and West Virginia: Native Plants and Geology of the Blue Ridge Province”

U.S. Fish and Wildlife Service National Conservation and Training Center

Shepherdstown, West Virginia

Instructions:

The following script is designed to accompany the PDF version of this presentation, which is downloadable from the Division of Natural Heritage website. The first paragraph corresponds to the title (first) slide. Each subsequent “■” indicates a slide transition.

■ Welcome to the PDF version of the Virginia Division of Natural Heritage presentation “Ecological Communities of the Northern Blue Ridge.” The purpose of the presentation is to provide a broad overview of the natural communities of the Blue Ridge region and relate their distribution to the geological and other environmental gradients. Before we delve into the plant life of the Blue Ridge, we will briefly address a few basic questions about the work of the VA Natural Heritage ecology program and the treatment of communities you’re about to see.

■ First, you may be wondering what an “ecological” community is. We define it as an assemblage of co-existing, interacting species (both plant and animal), considered together with the physical environmental and associated ecological processes, that usually recurs on the landscape. Implicit in this definition is the concept that similar assemblages occur at different sites under similar environmental conditions. It’s because of these repeating assemblages that we are able to recognize and define community “types.”

■ Another question we are often asked is how community inventory and classification contribute to biodiversity conservation. The short answer is that by conserving biotic communities we may be able to conserve intact ecological systems that contain numerous, diverse organisms, many of them poorly understood or difficult to inventory. In any given

region, there are simply too many redundancies and not enough resources to protect every rare species on an individual basis. Besides, the rarity of a species can vary dramatically from region to region or state to state. The status of species may also change over time. For instance, a species may become rarer due to a decline in its habitat, or conversely, fieldwork may reveal that a species is a lot more common than we thought. At Virginia Natural Heritage, we get around these problems to some extent with a working hypothesis that protecting excellent examples of all natural community types will protect populations of most native biota.

- Except for aquatic systems that lack vascular plants, we define ecological communities primarily by vegetation. There are very good reasons for this approach, which follows a national standard. First, vegetation typically reflects major environmental patterns across a landscape. It is also much easier to measure in various ways than either site conditions or animals, which tend to be either highly mobile or cryptic. Perhaps most importantly, many individual plant species – especially shrubs and herbs – are reliable indicators of specific site conditions such as soil fertility or moisture potential, and often have symbiotic associations with specific animals. In short, vegetation types essentially serve as the most practical surrogates for ecological communities.

- We would like to stress that what you're about to see is grounded in analytical methods rather than an arbitrary, subjective approach. Currently, our program has four full-time ecologists working as a team toward producing a statewide classification of ecological communities. Our work is based largely on quantitative plot data collected over the past 14 years and analyzed using cluster analysis, ordination, and other statistical methods. As a result, the procedures for measuring, describing, and comparing vegetation from different sites are standardized. Although the analogy isn't perfect, you could think of each plot as a "specimen" that can be compared with other plots in order to delimit vegetation "taxa," in much the same way as a botanist uses preserved plant specimens to determine the taxonomic limits of plant species.

- The taxonomy we use to define communities is hierarchical, with the finest level, the "community type," analogous to the "species" level in plant taxonomy and defined by a specific association of characteristic plants. Community type associations are assigned global and state rarity ranks by the Natural Heritage network based on criteria similar to those used to rank plant and animal species.

- Here is an example of a hierarchical classification of high-elevation rock outcrop communities. Since there are many individual community types or associations in the Blue Ridge, we're going to simplify things quite a bit and limit this presentation to the Ecological Group level.

So what is the status of community documentation on the northern Blue Ridge in Virginia?

- To date, data have been collected from more than 600 plots on the physiographic northern Blue Ridge. If you add another 142 plots from western Piedmont monadnocks that are essentially topographic and biological outliers of the Blue Ridge, then more than 20% of all plot data collected in Virginia since 1990 is representative of this region. That's a very high percentage considering the relative land area of the province. Much of the data have come out of major contract projects funded by the National Park Service and U.S. Forest Service.

- We should clarify that the area covered by this presentation is the physiographic northern Blue Ridge that stretches from Roanoke to Harpers Ferry. It also loosely includes the higher, western Piedmont monadnocks such as the Bull Run Mountains in northern Virginia and the Southwest Mountains east of Charlottesville. This is a more limited area than the geological Blue Ridge anticlinorium, which includes the entire physiographic western Piedmont.
- One of the reasons that we have collected so much plot data on the northern Blue Ridge is that 30% of the province is in public ownership, which has provided many opportunities for sustained ecological study and conservation.
- This area has quite an elevation range, from 240 ft above sea level along the Potomac River here at Harpers Ferry to 4225 ft on Apple Orchard Mountain just south of the James River. The province has 12 peaks over 4000 ft and a handful of others that fall just short of that mark.
- The area contains many headwaters streams of the Potomac, James, and Roanoke River drainages. Consequently, it is critical to the maintenance of good water quality in these watersheds, and it provides municipal water supplies to a number of small towns situated in both the Shenandoah Valley and Piedmont.
- These three rivers are the only streams that have breached the northern Blue Ridge, forming water gaps and gorges. The slide shows the Potomac River gap at Harper's Ferry.
- We won't attempt to explain the complex geology of the Blue Ridge here, but will stress that the various bedrock units can be aggregated into three major groups: the Pre-Cambrian granites and granitoid rocks that form the core of the Blue Ridge; the late Pre-Cambrian Catoclin formation; and the early Cambrian metasedimentary rocks. A lesson learned repeatedly over the years is that the major bedrock types and their surficial deposits exert a profound influence on the soil environments, floristic composition and distribution of plants on the northern Blue Ridge. Although there is certainly some compositional heterogeneity within each of three major bedrock groups shown on the slide, there are also many consistent trends and correlations between these groups and vegetation patterns in the Blue Ridge. Metabasalt rocks of the Catoclin Formation, as well as most charnockite and granulite members of the granitic complex, contain dark mafic minerals and produce fairly basic soils. Most bedrock units of the metasedimentary complex, as well as the Old Rag Granite, are strongly acidic and weather into extremely infertile soils. Consider this short passage from *Geology of the Shenandoah National Park* by Thomas M. Gathright, published in 1976: "Fertile and locally deep but stony soils have formed on the more soluble plutonic and volcanic rocks but only very thin sandy or shaly soils are present on the metasedimentary rocks. The difference in these soils is directly expressed in the size and species of trees growing on them The difference is most noticeable in October when the fall colors are at their peak ■ Then, the entire forest area underlain by the metasedimentary rocks takes on a drab yellow-brown hue while the colors in the forest on the volcanic and plutonic rocks ■ are bright reds, oranges, and yellows with many trees still partly or wholly green. The sharp color contrast probably reflects differences in soil moisture content as much or more than species differences between trees in the two rock types." This statement

resonates as strongly today as in 1976 and is strongly supported by the results of soil chemistry analysis from more than 700 plot samples in the region.

- The northern Blue Ridge in Virginia is about 98% forested, mostly with deciduous trees. The remaining 2% includes some farmland at low elevations and a few non-forested vegetation types occupying rock outcrops and wetlands.

- In the following overview of the most characteristic and important ecological community groups of the region, we are going to progressing from those that cover the largest area to those that cover the smallest. The information is based on data from Virginia. However, at least some of the communities of lower elevations will be applicable to the Maryland and West Virginia portions of the Blue Ridge. Also, many of the communities also occur in the Ridge and Valley and Allegheny Mountain provinces and may be familiar to some of you from these parts of the region. One other caveat: we only have time to show a very few of the most characteristic species of each group. Also, very few species are entirely confined to a specific habitat or community, and it is usually the combination or association of species that is diagnostic.

- There are four community groups that could be considered the “matrix” forests of the Virginia Blue Ridge – that is, forests that cover extensive areas and form a “matrix” within which smaller patches of more specialized vegetation occur. Probably the most widespread of these are the Oak / Heath Forests that occupy drier, infertile, rocky ridges and side slopes, especially on metasedimentary substrates.

- These are ubiquitous at elevations up to about 3200 ft and are usually dominated by stands of somewhat stunted chestnut oak and dense shrub layers of heath-family shrubs such as black huckleberry and mountain-laurel. A number of stands in Virginia escaped cutting because the trees are just too gnarled to be commercially viable. Unlike the one shown in the slide, some of these old-age trees are deceptively small.

- Most botanists are not very excited about these communities because they contain very few herbaceous plants and are quite species-poor, averaging only about 25 total species per 400 square meter plot.

- Nevertheless, a few attractive herbs like the pink ladyslipper and the dwarf iris do occur in these acidic forests. A real up side to this environment is that invasive, introduced weeds are extremely rare as most simply can't hack the poor soil and droughty conditions.

- Oak / Heath Forests in the region have been subject to frequent large-scale disturbances, both natural and anthropogenic. Prior to the introduction of the chestnut blight fungus around 1915, American chestnut was an important overstory tree in these and many other communities of the Blue Ridge. It is now reduced to small root sprouts.

- Oak/Heath Forests are also susceptible and well adapted to periodic fires. The photo on the left shows a stand top killed by a crown fire about five years ago but regenerating strongly from sprouts. Because fires have been suppressed in most areas, many oak/heath forests now have poor oak recruitment and their understories are dominated by huge numbers of fire-intolerant

trees such as red maple. In the last 10 or 15 years, many stands like the one on the right have also suffered extensive mortality by repeated defoliation by gypsy moth during periods of drought.

- At lower elevations on more fertile soils weathered from metabasalt, Basic Oak-Hickory Forests form the forest matrix. In contrast to Oak/Heath Forests, these communities are relatively species-rich, with patchy but diverse herb layers and very few heath shrubs.
- Instead, small trees such as redbud and eastern hop hornbeam dominate the understory.
- Several species of hickory are characteristic and share overstory dominance with oaks, in these forests. As a rule, our plot data show a strong positive correlation between hickory abundance and high soil fertility on dry-mesic to dry sites throughout the Virginia mountains and Piedmont. Tulip-poplar is also a common overstory tree in Basic Oak-Hickory Forests, especially in stands that have been heavily logged.
- In the early spring, this could be considered the “community of little white flowers.” Then, the herb layers of Basic Oak-Hickory Forests are usually covered by the blooms of rue-anemone, star chickweed, cut-leaved toothwort, and spring beauty.
- Later in the growing season, forest grasses such as Bosc’s panic grass and bottlebrush grass tend to dominate the aspect.
- At middle to high elevations, Montane Oak-Hickory Forests form the matrix on relatively fertile metabasalt and granitic substrates. These are similar to Basic Oak-Hickory Forests but usually have lush herb layers and contain more species typical of high elevations. Red oak, white oak, hickories, white ash, and striped maple are some of the most characteristic woody species. Chestnut oak is uncommon or absent in this vegetation.
- Herb layers of Montane Oak-Hickory Forests are often patch-dominated by one or two leafy, clonal forbs such as white snakeroot or horsebalm.
- Leatherleaf meadowrue is another typical herbaceous patch-dominant, and is the fine-leaved herb in the stand shown on this slide.
- This stand is typically of many that are overwhelmingly dominated by black bugbane.
- At the highest elevations, the matrix forest is formed by stands of wind- and ice-stunted northern red oaks. These communities occur almost entirely above the elevation range of chestnut oak and are clearly influenced by a relatively cool microclimate. Herbaceous patch-dominance of ferns and grasses such as hair-grass (*Deschampsia flexuosa*) is typical.
- Hayscented fern is another clonal herbaceous dominant whose abundance may be favored in places by selective grazing of large deer populations.

- Mountain holly, early azalea, and fly-poison are among the species that are especially abundant in Northern Red Oak Forests of the Virginia Blue Ridge.
- Large-Patch communities cover considerable areas, but are usually associated with more specific environmental settings than are Matrix communities. Pine-Oak/Heath Woodlands are such communities on the very dry, exposed ridges and southwest-facing slopes, particularly over metasedimentary rocks. This vegetation is floristically depauperate and occupies extremely acidic and infertile soils. Stands of pitch pine like this one are most common on ridges with shallow soil mantles.
- On cliffs and rocky areas, table-mountain pine is a more common species. This little tree on Bull Run Mountain is a good example of how tenacious the table-mountain pine is under incredibly harsh growing conditions. It grows out of a small rock crevice and is only about 7 feet tall. The picture was taken almost 25 years ago, and the tree looks much the same now as it did then. We recently cored this tree and discovered that it began life about 112 years ago, around 1891.
- Both pine species and other characteristic plants such as bear oak and turkey-beard require periodic burning to ensure regeneration and remove competing vegetation. Because of the widespread suppression of wildfires in recent decades, many stands of Pine-Oak/Heath Woodland are becoming more closed and invaded by chestnut or scarlet oaks.
- At the opposite end of the environmental spectrum are Rich Cove and Slope Forests that occupy moist, fertile ravines and slopes, primarily on soils weathered from metabasalt and pyroxene-rich rocks of the granitic complex.
- Sugar maple, basswood, and tulip-poplar are the most characteristic trees in mixed overstories with white ash, birches, hickories, red oak, and other hardwoods.
- Rich Cove and Slope Forests are well known for their very lush herb layers dominated by leafy, nutrient-demanding, spring-flowering forbs such as large-flowered trillium.
- Our plot data indicate that two of the most abundant and characteristic herbaceous dominants of northern Blue Ridge stands are blue cohosh and wood-nettle.
- Basic Mesic Forests are low-elevation analogues of Rich Cove and Slope Forests. They are primarily communities of the Piedmont and mountain valleys, but extend into ravines of the lower Blue Ridge slopes and foothills.
- Basic Mesic Forests can be distinguished in the study area by a prevalence of low-elevation species in the understory and herbaceous flora. Paw-paw is one of these and usually dominates the understory in large clones.
- Two of the characteristic herbs that are rarely if ever found in rich forests at higher elevations are the twinleaf and toadshade trillium.

- Moist ravines and lower slopes on the metasedimentary portions of the Blue Ridge have extremely acidic, infertile soils and support communities classified as Acidic Cove Forests. These forests generally have mixed overstories of tulip-poplar, sweet birch, cucumber magnolia, red maple, oaks, and hemlock.
- One of their most characteristic features is the frequent abundance of evergreen rhododendrons, especially the Catawba rhododendron. In the southern Appalachians, this species is outcompeted by the great rhododendron in coves and is largely restricted to rocky summits and balds. However, on the Blue Ridge north of Roanoke, the distribution of great rhododendron becomes much more spotty, and the Catawba is able to move downslope and occupy moist ravines with suitably acidic soils.
- Some of these cove forests contain large specimens of white pine and beech, which is not often found elsewhere on the Virginia part of the northern Blue Ridge.
- The herb layers of Acidic Cove Forests often have a kind of evergreen lushness with species like galax and Christmas fern forming large colonies.
- Forests dominated by eastern hemlock are found in sheltered, cool habitats throughout the Blue Ridge. They don't seem to show much preference among geological substrates but are usually partial to north aspects and protected landforms with low solar exposures.
- We have classified several hemlock community types, including a rare one that has an understory of Catawba rhododendron and a more common one that usually has mixtures of hemlock and yellow birch with very sparse understories.
- Northern herbs such as intermediate woodfern and Canada mayflower are characteristic but scattered in many hemlock communities. Unfortunately, eastern hemlock forests are on the verge of extirpation in Virginia because of massive outbreaks of hemlock woolly adelgid. This introduced aphid-like insect is capable of quickly defoliating and killing entire stands of hemlock.
- I'm sure most of you have witnessed this kind of tragedy somewhere in the region: a perfectly healthy stand of old hemlocks ■ reduced to a ghostly forest of snags.
- Many slopes of the northern Blue Ridge are mantled with coarse rock fragments and support distinctive communities that ecologists refer to as boulderfield forests or woodlands. The term "boulderfield" is a broad one that applies to debris mantles that a geologist might variously classify as talus, scree, block fields, or bouldery colluvium.
- Many boulderfields of the highly resistant quartzites remain completely unvegetated by vascular plants. As a rule, the peripheries of these fields are very slowly invaded by a few species capable of rooting in the deep interstitial areas between the rocks.

- Sweet birch is the characteristic tree of these invading woodlands and seems uniquely adaptable to extremely difficult soil and microclimatic conditions imposed by the boulderfield habitat.
- The dominant birches on these sites typically have a fantastically gnarled and gnomish growth form.
- As organic matter gradually fills the interstitial spaces of the boulderfield and a minimal soil begins to form, vegetation develops more of a forest physiognomy and other tree species start to become established.
- Lichens are probably the most abundant life-form of these environments. *Lasallia papulosa*, a type of rock-tripe, is usually the most conspicuous lichen on the quartzite boulderfields. Virginia creeper is one of the few understory plants capable of rooting and thriving here. Lastly, north-facing acidic boulderfield woodlands between 2000 and 3000 ft elevation are the principal habitats for disjunct populations of paper birch in Virginia. This is somewhat surprising as one might think this northern tree would occur at higher elevations.
- Most lower elevation boulderfields of metabasalt, granitic rocks, and less resistant metasedimentary rocks such as metasilstone and phyllite have deeper deposits of somewhat basic soil materials and are vegetated with closed-canopy forests. This vegetation is not as clearcut in its geologic affinities, and sometimes even occurs on quartzite in moist situations.
- These Basic Boulderfield Forests and Woodlands tend to be dominated by mesophytic trees like basswood, white ash, and northern red oak and usually have a good representation of nutrient-demanding forbs. In this respect, they have some affinities to the Rich Cove and Slope Forests.
- Yellow jewelweed, leafcup, and red elderberry are especially abundant and characteristic plants on the basic boulderfields in Virginia.
- Marginal woodfern is also very characteristic. Lastly, there is an association in this group that, interestingly, is found on fine bouldery colluvium of both metabasalt and quartzite and features enormous clones of *Aralia nudicaulis* up to several acres in size.
- At elevations above about 3300 ft, boulderfield habitats support another distinctive vegetation assemblage. Here, cold winter temperatures, extreme winds and frequent ice storms become prominent influences that seem to over-ride the influence of bedrock and soil chemistry. Some of the best examples of this habitat occur on the north flanks of Hawksbill, Stony Man, and other high peaks in Shenandoah National Park. There are also great examples in the Ridge and Valley province in both Virginia and West Virginia
- These are somewhat dangerous places, full of deep camouflaged crevices and loose rocks, and they pose big challenges to plot sampling.

- Yellow birch assumes the same role that sweet birch does on the low-elevation quartzite boulderfields and has a similar ability to root on and around large rocks. The only other tree found consistently in high elevation boulderfields is the American mountain-ash.
- High-elevation boulderfields support many regionally uncommon lichens and bryophytes, including *Stereocaulon tennesseensis*, a narrow Appalachian endemic, and *Hylocomium splendens*, a moss often found in spruce forests.
- Normally, these communities have very low species richness and few herbs. Two of the most common in Virginia are the Appalachian rock-cap fern and the bluebead lily.
- I can't leave high-elevation boulderfields without mentioning that four sites in Shenandoah National Park host the only known populations in the world of this beautiful little salamander.
- This brings us to the Small-Patch Communities that occupy relatively inextensive and specialized environments. They also tend to be rare and botanically interesting, so I'll spend a little more time on a few of them. The ecological group of Basic Woodlands consists of a single community type that occurs on very dry, rocky slopes, mostly on metabasalt but occasionally on pyroxene-rich granitic rocks, phyllite, and metasiltstone as well. Soils collected from plots of these habitats have high calcium, magnesium, and manganese levels. The vegetation also ranks as the most species-rich on the Blue Ridge, with an average of about 75 species per 400 square meter plot.
- Basic Woodlands are dominated by open stands of stunted white ash and pignut hickory, which you can see fairly well in this photograph – the mauve colored trees being ash and the yellow hickories.
- The herbaceous flora contains a very diverse assemblage of drought-tolerant grasses, sedges, and forbs. These are four of the most abundant and characteristic species.
- We have found a variation of this community at several sites west and southwest of Charlottesville that has considerable ephemeral seepage through the rocks and an herb layer overwhelmingly dominated by river oats.

The basic woodlands usually occur in patch-mosaics with more open scrub and graminoid-dominated communities of the rock outcrops themselves. ■ These graminoid communities are classified as Low Elevation Basic Outcrop Barrens. They usually occur on south- to west-facing, middle-slope outcrops and are mostly numerous on metabasalt. In the past, these were sometimes referred to as “greenstone barrens,” but the name has proven too restrictive since similar vegetation has been documented on granitic rocks, phyllite, metasiltstone, and even calcareous sandstone in the Ridge and Valley.

- These are extremely dry, rocky, exposed habitats that support scattered shrubs and stunted trees, with herbaceous patches rooted on thin-soiled ledges, in crevices, and in moss mats.

- Eastern red cedar is a very characteristic tree here and can apparently reach ages of 200 years or more despite stressful growing conditions.
- Dominant grasses include tussock-forming perennials such as little bluestem and delicate annuals like lacegrass.
- Two of the most characteristic forbs are the nodding onion and the fame-flower, which usually inhabits moss mats.
- A few of the other interesting or rare plants of low-elevation basic outcrop barrens are the hair-awn muhly and its congener spiked muhly, which usually occupies areas of ephemeral seepage on the rocks. The hard-leaved goldenrod is a midwestern species that is disjunct in a few prairie-like habitats in the east.

If you spend a lot of time around these outcrops, ■ you should watch where you step since they are among the best Blue Ridge sites for timber rattlesnake hibernacula.

- One of the most surprising discoveries VA Natural Heritage ecologists have made over the years was the occurrence on metasilstone and phyllite slopes of the Blue Ridge of environments and vegetation resembling shale barrens. We have found a number of these “metashale barrens” on the western flanks of the Blue Ridge, both north and south of the James River.
- As you can see from this photograph, the Blue Ridge sites greatly resemble the Devonian, Silurian, and Ordovician shale barrens of the Ridge and Valley in their general environmental character. Analysis of plot data collected from both provinces indicates that the Blue Ridge barrens can be included in the typical Central Appalachian shale barren community type.
- The only shale barren endemic that occurs on the Blue Ridge sites is *Senecio antennariifolius*. It is locally abundant, along with *Clematis coactilis*, a species found on both shale and limestone in the Ridge and Valley.
- Exposed bedrock at high elevations of the Blue Ridge supports several community types. Outcrops of the granitic complex support sparse, often dwarfed shrublands of black huckleberry, mountain-laurel, and other heaths.
- One of these communities in Shenandoah National Park contains Virginia’s only known colonies of the boreal heath bearberry, which is the low, creeping plant in the left photograph. The Greenland stitchwort is another boreal disjunct that occurs on several of the granitic barrens.
- High-elevation metabasalt outcrop barrens appear to be endemic to about 25 more or less discrete outcrops in Shenandoah National Park. These are located primarily on the upper west flanks of the Hawksbill, Stony Man, Crescent Rock, Franklin Cliffs, and Mount Marshall areas. The habitats are frequently wind-blasted and subject to severe winter temperatures and ice. Soils are limited to localized thin veneers of organic matter, gravel, and silt.

- On the exposed rock surfaces, boreal lichens such as *Rhizocarpon geographicum* and *Melanelia stygia* are common.
- The sparse shrub and herbaceous vegetation consists of northern bush honeysuckle, Rand's goldenrod, three-toothed cinquefoil, wavy hair grass, and a few other hardy species.
- Although somewhat less restricted to these habitats, Allegheny stonecrop and Michaux's saxifrage are also common members of the community.
- High-elevation metabasalt barrens support eight state-rare species, most of them long-range boreal disjuncts that are probably Pleistocene relicts. The only known Virginia populations of highland rush and hemlock parsely occur on Stony Man Mountain. The boreal grass *Trisetum spicatum*, which is not shown, occurs on one cliff on the north face of Hawksbill. The Appalachian fir clubmoss is found at several sites.
- There are few wetlands on the northern Blue Ridge and all of them are localized small-patch communities. Acidic seepage swamps occur in groundwater discharge areas along headwaters streams cutting through metasedimentary substrates. As their name suggests, these communities develop on saturated soils with low pH and fertility.
- These forested wetlands tend to be dominated by red maple, black gum, highbush blueberries, cinnamon fern, and sometimes skunk-cabbage or false hellebore.
- Both *Sphagnum* mosses and bristly dewberry form extensive mats in most acidic seepage swamps of the region.
- Basic seepage swamps occur in the same type of environmental setting over metabasalt and pyroxene-rich granitic rocks. The soils here are relatively fertile and the vegetation more species-rich compared to those of the acidic swamps. *Sphagnum*, bristly dewberry, and other acidophiles are conspicuously absent.
- Marsh marigold and black ash are usually indicative of the basic seepage swamps. The nodding trillium is a state-rare species associated with hummocks in a few basic swamps in the northernmost part of the state.
- Two globally rare plants are locally abundant in northern Blue Ridge basic seepage swamps. The glade spurge is a large, showy plant of the Euphorbia family, while the bog bluegrass is a delicate, ephemeral grass that hides in mossy sedge tussocks for just a few weeks in late spring and early summer.
- High-Elevation Seepage Swamps occur above about 3300 ft elevation and usually have mixed overstories of hemlock and yellow birch. Like many of the other high-elevation forests, they are not partial to specific substrates, and occur commonly on Ridge and Valley sandstones as well as plutonic and volcanic rocks of the Blue Ridge.

- The hummocks of these swamps are covered with very diverse bryophyte mats that often include the interesting liverwort *Bazzania trilobata*. Among woody plants, the northern speckled alder occurs in the understory of a few swamps on the northern Blue Ridge. The herbaceous flora also has a northern flavor and usually includes American water-carpet, as well as ■ rose twisted stalk, and whorled wood aster.
- Mafic seeps are extremely rare on the northern Blue Ridge and confined to the vicinity of Big Meadows in Shenandoah National Park. These are shrubby seepage wetlands situated in high-elevation metabasalt terrain. Soil samples collected from plots had notably high magnesium levels.
- The Big Meadows area has been subject to clearing, grazing, burning and other disturbances since European settlers arrived, so it's difficult to know what these seeps looked like originally or what their natural disturbance regimes were. Today, they support a mosaic of shrub thickets and herbaceous openings. One of the diagnostic graminoids is bluejoint reedgrass.
- The dominant shrub is meadowsweet, while the most diagnostic forb is probably Canadian burnet, a state-rare species in Virginia.
- Two of the most common sedges are *Carex buxbaumii* and *Carex scoparia*. A large population of the state-rare plant buckbean also occurs in one of the seeps but was only recently rediscovered after having not been seen since 1940.
- Natural depression ponds are very rare on ridges of both the Blue Ridge and Ridge and Valley provinces in Virginia. These usually occur on crests or large slope benches and are thought to have originated from sagging of underlying bedrock strata or landslide masses. The pond shown in the photograph is Green Pond, located on a broad quartzitic summit of the Blue Ridge in Augusta Co., The sedge growing in the water is Virginia's only population of *Carex aquatilis*, a long range northern disjunct.
- Most of these ponds contain fewer than ten plant species, the most common of which are buttonbush and three-way sedge.
- Riverside Prairies occur on channel shelf bedrock and boulder deposits along high-gradient sections of major rivers. Frequent flood-scouring of these habitats tends to remove woody plants and encourage an unusual association of grasses and forbs with affinities to prairie vegetation.
- On the Virginia Blue Ridge, occurrences are limited to the James River Gorge. Some of the finest riverside prairies in the world occur near Washington, D.C. along the Potomac River from Chain Bridge flats to Great Falls.
- Along the James in Virginia, big bluestem, switchgrass, and Indian grass are the usual dominants.
- Although not as frequent, freshwater cordgrass is probably the best indicator of the community type. Among the many forbs that occur in this vegetation, the wild blue indigo is

almost entirely restricted to these prairies and adjacent rocky bars, and is thus considered especially diagnostic of the community type.

- And that concludes this tour of northern Blue Ridge habitats and vegetation.